

## Aberystwyth University

### *Cross-language information seeking behaviour English Vs Arabic*

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**Cross-language information seeking behaviour  
English Vs Arabic**

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**Cross-language information seeking behaviour**

**English Vs Arabic**

**Introduction**

The user population of academic databases is heterogeneous consisting of users of disparate languages background, computer skills, different needs and different ways in expressing those needs. Academic databases provide scholars with the information to build their knowledge. English language is considered the dominant language in these databases. However, a wide range of academic databases are now available in other languages including Arabic language and more databases offer multilingual retrieval facilities.

Searching in different languages might affect users' behaviour, which in turn is reflected in the various search strategies such as: problem formulation, query constructing, information seeking, evaluation of documents and relevance judgment. The variation with which users interpret their needs and follow different ways in searching the tasks in both languages is what motivated this research which will try to explain the information seeking behavior (ISB) of users when searching similar tasks in the Arabic and the English database.

This project aims to identify, compare and model the ISB of academic staff when searching Arabic academic databases and English academic databases, by examining the behavior of the academic staff of social sciences faculties in Jordanian universities when searching two academic databases. One in Arabic (E-marefa) and one English language database(Science direct). The research explores whether, and how, the language choice may affect their needs, aiming at the end to propose an information behavior model to account for Cross-Language Information Seeking behavior (CLISB).

**Related literature**

Three different concepts appeared to be used in the literature, information behaviour, ISB and information searching behaviour. As this research project is dealing with ISB, it is worth

defining the three concepts and show the differences mentioned in the literature. Information behaviour was defined by Wilson (2000) as “*the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use*” (P49). The term information behaviour appeared and defined in different studies, such as Ellis, 1989; Kulthau, 1991, 1993, 1997; Dervin & Nilan, 1986; Wilson, 1994, and more recent studies such as Foster 2003, 2004, 2011; and Wilson, 2006.

ISB was defined by Case (2007) as “*the actions individuals take when they recognize that their knowledge is inadequate to satisfy their goals*” (Case, 2007, p.5). This definition has resemblances with the early definition of Krikelas (1983) who states that ISB is “*any activity of an individual that is undertaken to identify a message that satisfies a perceived need*” (Krikelas, 1983, p.6). It was also defined by Wilson 2000 as “*the purposive seeking for information as a consequence of a need to satisfy some goal*”. Chowdhury (1999) described it as “*the pattern of using information systems*”. (p 187)

Information searching behaviour appeared as a subset of the ISB, and most of the times is implicit within the definition of the information search process (ISP). Khulthau (1993) defined ISP as “*the user’s constructive activity of finding meaning from information in order to extend his or her state of knowledge on a particular problem or topic*” (p 361). Wilson (2000) defined it as “*the micro level of behaviour employed by the searcher in interacting with information systems of all kinds, It consists of all the interactions with the system, whether at the level of human computer interaction ... or at the intellectual level*” (p 49).

### Information needs

One of the earliest works on information needs was Robert Taylor’s theory of information need development (1962, 1968). Taylor describes how an inquirer obtains an answer from an information system by performing the process consciously or unconsciously. He categorizes the information needs under four categories: visceral need, conscious need, formalized need, and compromised need. Bruce (2005) argues that “*Taylor’s work laid the foundation for a deeper conceptual understanding of the motivations or triggers for information seeking. It was the basis for subsequent insights by researchers such as Belkin, Saracevic, Ingwersen, Dervin and Kuhlthau*” (p271).

However, Pikas (2009) argues differently, and states that the compromised information needs in Taylor’s theory needs to be reconsidered, as what comes out from the inquirer as a compromised need might be very different from the actual need because there are labelling problems as the inquirer might not know what he/she needs or how to describe what is needed. Cole et al (2005) adds to the same point that the information needs of the searchers do not remain stable during the information seeking process.

The information need as the trigger of the information seeking behaviour appeared in user oriented research (Wilson,1981; Belkin et al, 1982; Dervin & Nilan, 1986; Kuhlthau 1991, Ingwersen,1996; Spink et al,1998; Case,2002). Belkin et al (1982) in their *Anomalous state of knowledge hypothesis (ASK)* described the information need as “*an information need arises from a recognized anomaly in the user’s state of knowledge concerning some topic or situation and that in general, the user is unable to specify precisely what is needed to resolve that anomaly*” (Belkin, Oddy and Brooks,1982, p62). Chowdhury (1999) similarly described information need as an unsolved problem when users realize that their current state of knowledge is insufficient to resolve tasks at hand.

Various writers have discussed the change in the information needs during the search process, for example Bates, 1989; Kuhlthau, 1993; and Chowdhury, 1999. Bates' (1989) “Berry picking” model is based on the notion that users' information needs evolve during the search process depending on the pieces of information they encounter. Ingwersen (1996) described the different types of human intrinsic information needs in a matrix based on the work of Bates' Berry picking model, which contains four different types of information needs; the ill-defined variable needs, ill-defined stable needs, well defined stable needs and well defined variable needs.

**Information needs and problem solving**

The information need is mentioned in the information retrieval literature in relation to problem formulation and solving. Problem formulation and problem solving are distinct phases in task performance. Bystroem &Jaervelin State that in problem solving situations, the problem formulation creates a solution space and determines the requirements for the task. (Bystroem &Jaervelin, 1995). Vakkari (1999) adds to the same point “*After the*

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3 *formulation step, the actor has a problem that might be solved, and he knows more clearly*  
4 *what information is relevant. The problem formulation includes the choice of the central*  
5 *elements (concepts and their relations) of the task and guides the actor to focus on them.”*  
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8 (Vakkari,1999 p826).  
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### 10 11 **Task based research**

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14 Recently, more studies paid attention to tasks as the contextual factor affecting information  
15 seeking and retrieval studies (Järvelin & Wilson 2003; Järvelin & Ingwersen,2004; Vakkari,  
16 2003; Kelly, 2006;Kim,2008 ). Such studies shifted the focus from the problem to the task as  
17 the trigger of the information seeking process. Case (2007) states that the shift in focus from  
18 ‘problems’ to ‘tasks’ and the perceived difficulty of the tasks impacts on the success of the  
19 search process (Case, 2007). Marchionini (1995) defined task as the following “*A task is the*  
20 *manifestation of an information seeker’s problem and it is what derives information-seeking*  
21 *actions”* (p36)  
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29 Hancock-Beaulieu (1990) explained that the motivation for using assigned search goals is to  
30 control the effects of process variables on search performance. More recently, a growing  
31 interest in developing assigned search goals has appeared in the studies of information  
32 searching and retrieval. The term simulated search goals appeared, for example in the work of  
33 Vakkari who writes that: “*Interest in developing simulated search goals as a function of*  
34 *(work) tasks has been growing... The aim of a simulated search goal is to imitate natural*  
35 *search goals by means of a “cover story,” which describes a situation that may lead to*  
36 *information searching”* (Vakkari, 1999 ,p422).  
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### 43 **Information behaviour models**

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47 Many researchers have put considerable effort into the study of information seeking  
48 behaviour of people, and have developed models and theories discussing their findings  
49 (Foster, 2005; Case,2012). Major models include Devin’s sense making model of (1983),  
50 which was one of the first attempts to characterize users' needs. Wilson's model of (1981)  
51 considers one of the factor relationship models which show a set of factors that impact the  
52 information behaviour. The information seeking behaviour in this model resulted from a  
53 perceived need and the routes users take to satisfy such needs. Wilson’s second model  
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(Wilson, 1981) is an attempt to quantify external factors influence the information seeking process. Wilson identified that the basic needs are influenced by the individual's role and the environment; these needs can be physiological, cognitive or affective. Information seeking behaviour is affected by personal, interpersonal and environmental barriers and these barriers may result in incomplete satisfaction of the need which may prevent the information seeking from taking place at all. Wilson allows for time-lags, serendipity and the personal characteristics of the information seeker.

Ellis's (1989) behavioural model of information searching strategies is one of the search process models. It is considered one of the models that has gained strength as it is based on empirical research and has been adopted as the basis for further research by other investigators (Wilson,1999). Ellis presented the information seeking behaviour patterns of social scientists by breaking them down into six characteristics or as he called them 'features': starting, chaining, browsing, differentiating, mentoring and extracting.

Kuhlthau's model of (1991) consists of different stages starting of initiation, selection, exploration formulation, collection, ending with presentation . The model becomes a complement of that of Ellis by attaching to stages of the 'information search process' the associated feelings, thoughts and actions, and the appropriate information tasks (Wilson,1999). However, the model differs from Ellis's (1989 ) in the way in which she brings emotional and cognitive aspects to the searching process.

As this research project is a task based research, it is important to consider the task based models. Byström and Järvelin's model (1995) was developed following research on civil servants. According to Case (2007) the model gained validity as it was empirically tested by different studies (Bystrom, 2002, Bell and Ruthven, 2004). This model differs from other models as it shifts the focus to task instead of problem. According to Bystrom and Jarvelin (1995) the information seeking behaviour process depends on the complexity of the tasks involved in locating the desired information, the information seeker proceeds depends on the complexity of the task.

Another task based model is the Leckie, Pettigrew, and Sylvain (1996) model. It is deliberately limited in scope to a range of people—in this case, three distinct professional groups (engineers, health care professionals, and lawyers). It is a linear model that features

six general factors connected by arrows all of them influence each other. The model emphasizes *work-related* information seeking and so is limited in its applicability to the behaviours of a general population in everyday activities (Case,2007). Kim (2007) also presents a conceptual framework as a task based model for information seeking behaviour, draws on previous studies for task-based information seeking models.

### Research questions

This research will answer the following questions:

1. Do information seekers generate different information needs depending upon the language used?
2. If they do, how do information needs relate to aspects of behaviour such as problem formulation, search querying, information seeking and relevance judgments?
3. Is it possible to develop an information behaviour model to account for Cross-Language Information Seeking behavior of the subject group?

### Methodology

This research uses grounded theory as the research approach. Strauss and Corbin (1990) defined grounded theory as the following “*an action/interactional oriented method of theory building. Whether one is studying, individuals, groups, or collectives, there is action/interaction, which is directed at managing, handling, carrying out, responding to phenomenon it exists in context or under a specific set of perceived conditions. The interactional component refers to self as well as other interactions*” ( Strauss & Corbin, 1990.104).

### **The experiment was designed in reference to Ha (2008) study *Accessing and Using Multilingual Information by Users Searching in Different Information Retrieval Systems*.**

Each experiment lasted thirty minutes to an hour. Sixty of the academic staff from the social sciences faculties in Jordanian universities participated in this experiment (only 57 experiments were used in the data analysis) to search for randomly selected topics within the two chosen databases using their own information seeking strategies. Two of the tasks given to the subjects were assigned by the researcher and the third task was left for the subjects to search for any topic they were interested in at the time of conducting the experiments.



The chosen databases are available freely to the participants through the consortium of Public Jordanian universities, those are:

- Science direct: Academic database in English
- E-marefa: Academic database in Arabic

The experiments took place in the subject group's work places, usually their offices. The researcher captured the information seeking behaviour of the subjects with the use of think aloud protocols; that is, by prompting the subjects to search for the tasks and think aloud. The experiments and the interviews were voice recorded.

**Overall design for the experiment**

Each subject was assigned three topics to search for in two different databases, therefore each subject provided 6 searches.

**Insert table 1 here**

Using think aloud protocols within the experiment was done on purpose, as the researcher believes that examining the behaviour of the subjects by using artificial setting such as interviewing subjects to describe their information seeking behaviour will not generate enough reliable and valid data. It was felt that the experiment would generate more credible data in this context. Think aloud protocols were found to be compatible with the use of the grounded theory as a methodology. Verbal protocol procedures such as think aloud protocols are the most telling analyses of complex, conscious, self-regulated cognitive process. The verbal protocols are analyzed by encoding full transcripts, and selecting codes later to allow a meaningful analysis (Ericsson and Simon, 1993). Think aloud protocols method “*helps to gain information about the cognitive processes of a participant’s internal states while performing tasks*” (Guha and Saraf ,2005.464).

**Semi-structured interviews**

Each experiment was followed with a semi- structured interview. The interviews were designed and conducted to capture qualitative data from the subjects about their feelings, problem formulation, search querying, preference of search language, differences between searching the two languages and any differences in relevance judgment criteria in both languages. The interviews were conducted exactly after the subjects finished searching the

tasks. Each interview was voice recorded to allow accurate transcription and detailed analysis.

### **Participants:**

The researcher followed a purposive or theoretical sampling technique. The sample was chosen purposively for the aims and the objectives of the research project. The sample is built up to satisfy researcher developing needs in the project, by carrying out initial sampling and later the analysis guided the researcher in building up a new more purposive sample (Robson, 2011).

The population in this project is the academic staff in social sciences faculties in Jordanian universities. The sample frame is all public Jordanian universities excluding Jordan University of Science and Technology since the focus of this project is on staff of social sciences faculties.

### **Theoretical sampling of the tasks and the participants**

Each subject searched three topics. All topics are linked to the concept of topic familiarity, in other words all participants have a previous knowledge about the topics. All topics were in the field of management which is an interdisciplinary subject in the social science field. Also all topics have the research aspect of having scholarly information in the databases. Below is a description of the sampling process and the changes that happened to tasks.

### **Sample one**

At the beginning of conducting the experiments the three tasks that were given to the subjects were as following:

- Topic 1: Access to information

Assume that you need information about the information accessibility in organizations.  
Be sure to get high quality information on the topic.

- Task 2: Decision making in management

Assume that you need information about The Decision making in top management. Be sure to get high quality information.

- Topics 3 any topic you have been interested in.

Sample one consisted of 12 subjects. After conducting the 12 experiments and analysing these experiments, the researcher noticed that using more compound topics would help generate more data, therefore the assigned tasks were changed in sample two.

**Sample two**

This sample consisted of 22 subjects:

- Topic 1: Organizational justice and employee loyalty

Assume that you need information about the effect of organizational justice on employee loyalty. Be sure to get high quality information on the topic.

- Task 2: Social responsibility and business ethics.

Assume that you need information about the importance of social responsibility in business ethics. Be sure to get high quality information.

**Sample three**

The analysis of the second sample revealed that the education of the subjects play a role in their behaviour in searching in the two languages, therefore it was decided that it was necessary to use a more purposive sample that consists of a mixture of subjects who received their education in Arabic language and subjects who received their education in English language.

**Data analysis**

The data analysis of the experiments was conducted by following the grounded theory technique recommended by Strauss and Corbin (1990), which is by creating different codes form the available data and grouping these codes under different categories. The analysis started with initial coding of the transcripts by using the comment tool available in Microsoft word, through a process of close reading line by line, and then the coding was repeated using NVIVO 10 software. The subsequent iterations of reading each experiment transcript and comparing it with the other experiment transcripts allowed the emergence of codes, categories and themes.

**Rigour**

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3 Glaser and Strauss (1967) discussed the plausibility, credibility and trustworthiness of the  
4 research during the different stages of the research. Unlike Lincoln and Guba (1985), Glaser  
5 and Strauss (1967) and Strauss (1990) did not give a model or a clear direction for testing the  
6 trustworthiness of the research at the end of the research, rather they suggested a process of  
7 verification during the study. In this research project, it was decided that the rigour of the  
8 research would best be maintained by following a continuous process of checking. The  
9 following criteria, based on the work of Bryman (2008) and Mores et al (2002), was used to  
10 maintain rigorous research (See also figure 1 below).  
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19 The first criterion is methodological coherence, to ensure congruence between the research  
20 questions and the methodology. At the beginning of designing the research project a table  
21 was drawn by the researcher to link the research questions with the questions of the post task  
22 interviews (see table 2 below) to ensure the coherence of interviews questions with research  
23 questions.  
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27 The second criterion was the selection of relevant site and participants which ensured that the  
28 sample consists of subjects who best represent or have knowledge on the research topic. To  
29 ensure this, three research oriented universities that provide wide range of academic  
30 databases were chosen. This ensured that the later chosen sample have an experience in  
31 searching databases. In addition to that, invitation forms to participate in the experiment  
32 were sent to participants with the following sentence "Please, only sign in this form if you  
33 use academic databases in regular basis for conducting your researches or for using them in  
34 teaching". Moreover, by following theoretical sampling a purposive sample that best answer  
35 the research question was built up.  
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44 The third criterion is the collection of relevant data by collecting and analyzing data  
45 concurrently. Using the grounded theory facilitated this process where the researcher was  
46 collecting the data from the first group, transcribing the experiments, analyzing them and  
47 conducting new experiments at the same time. Thinking theoretically is the fourth criterion.  
48 Morse et al (2002) state "*Ideas emerging from data are reconfirmed in new data; this gives*  
49 *rise to new ideas that, in turn, must be verified in data already collected*" (Morse et  
50 al, 2002: 18).  
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The last criterion was adopted from Mores et al (2002) “theory development is to move with deliberation between a micro perspective of the data and a macro conceptual/theoretical understanding. In this way, theory is developed through two mechanisms: (1) as an outcome of the research process, rather than being adopted as a framework to move the analysis along; and (2) as a template for comparison and further development of the theory” (p18). the research was started with an open research question to identify and compare the information seeking behaviour of the subjects in both languages, the data collection and the analysis of data led the researcher to a new sets of research questions, that needed further data collection and further comparison of the data which at the end led to emergence of the theory.

**Insert figure 1 here**

**Insert table 2 here**

**Findings**

The analysis of the tasks revealed that there were some differences in seeking the information in Arabic language and English language and some differences in searching the familiar and the unfamiliar topics. The data analysis of the experiments and the post task interviews revealed that the information seeking behaviour of the subjects generally evolved around three strategies ;the lead in, the core and the closure strategy. These strategies were named according to the nature of the processes and the activities that happened in each stage.

**1. Lead in**

Lead in strategy is the first of the three strategies revealed by the data analysis. Lead in is the means employed by the subjects to start searching the tasks. In searching for the tasks in the Arabic language the lead in strategy occupied subjects more time than in searching in the English language. The analysis revealed that the lead in stage consisted of different tactics, feelings and thoughts.

**1.1 Problem Contemplation**

Contemplation is defined by the online Oxford dictionary as “The action of looking thoughtfully at something for a long time”. Subjects spent a considerable amount of time at the beginning of searching the tasks in Arabic language in order to identify the keywords and where to search the tasks. Therefore, two tactics appeared under problem contemplation.

## 1.2 Identifying keywords

Identifying the keywords for the tasks was a major tactic the subjects undertook in searching Arabic language. The tasks that were given to the subjects did not suggest any specific words rather they imagined scenarios for searching on specific topics. This was done on purpose to ensure that subjects were not led to search for specific keywords, and to capture their behaviour in starting the search for unfamiliar topics. Identifying keywords was undertaken in English language searching also, but it occupied more time and space in the information seeking behaviour of the subjects when searching in Arabic language.

The language in which the education was received played a major role in the *identifying keywords* tactic in both languages. Subjects of English language education tended to spend more time in identifying the keywords of the tasks in Arabic. However the reverse was true, but it appeared in less intense with some of the subjects with Arabic language education. It was explained by the subjects that they are more exposed to English terms as English language is the dominant publishing language, though they do most of their readings in Arabic language. The following extracts show a high uncertainty in identifying the keywords by the subjects who received their education in English language. The following is an extract from a subject who received his education in English.

*OK, here the second task is about المسؤولية الاجتماعية Almasooleyeh Alejtemayeh (Social responsibility) is it right? Because I never read about the topic in Arabic, I encountered social responsibility in my field in English language but not in Arabic, that's why I took some time to come up with the right words! Though Arabic is my first language, but I guess because I studied in English language, that's why. [SHEUFA1]*

On the other hand, subjects who received their education in Arabic language tended to start searching the Arabic tasks faster than the other subjects as they are more exposed to Arabic terms than the other group. Also, the analysis of the post task interviews revealed that the publishing language played a major role in this case. Subjects who received their education in Arabic language tended to publish their works in Arabic language with some works published

in English. But they mentioned that they rely on Arabic language as a publishing language. Therefore, they do more reading on the Arabic literature of the topics than the English one.

*Well, here in this task I'll select human and social sciences, then click continue!...Then in the advanced search I'll type in الوصول للمعلومات alwosol lel malomat (access to information) [SPAUF24]*

Two groups appeared in starting the initial search query. Some subjects started with short query while others started with long query. The former group had more openness and flexibility than the latter group. It appeared later that the subjects who used short queries maneuvered more during the search process by linking the search words with other search words in order to explore the topic field to retrieve relevant results than the subjects who used long queries. Also, most of the subjects who used long search queries at the beginning retrieved no results at the first time. The following is an example of the behavior of the subjects in starting the search query and their behavior in the maneuvering tactic later.

Subject 1 started the initial search query with long phrase and retrieved no results the first time, however, he spent the rest of the search process in trying to find the search words that retrieve relevant results.

*I'm typing اتخاذ القرارات في الادارة العليا itekhaz alkarart aldarah alolyeh , (decision making in top management) I'm using the same words as you gave me in the instruction sheet. I got no results! I'll make it اتخاذ القرارات itekhaz alkrarat (decision making) only, also no results. I'll put الادارة العليا aledara alolyeh (top management), I got 88 results. What if I connected it with اتخاذ القرارات itekhaz alkrart (decision making) all in the title field . The language to be all and the document type to be article. Then search, I got no results. Ok, I'll search for اتخاذ Itekhaz alkarart fe aledarah (decision making in management) in the title field and then search, I got 311 results. [SPEUFA1]*

*I'll type in the basic search box العدالة التنظيمية و الولاء الوظيفي aladalah altanzemeyeh wa alwalaa alwazeefee (organizational justice employee loyalty) I'll try this long phrase and see what I'll get. No results! OK then I'll search for keywords only I'll*



search for العدالة التنظيمية *aladalah altanzeemeyeh* (organizational justice alone). I got results now. [SPEUFA1]

On the other hand, the opposite behaviour was observed when subjects searched for familiar topics. In this case, subjects used long search queries from the beginning. This was because subjects hold level of knowledge about their topics of interest and they had experience in searching their own topics, the search queries appeared to be as precise as possible. However, they were faced with the lack of effectiveness of the E-marefa in using long search queries and retrieved no results most of the times.

The following extract comes from subject 31 who used short search queries in searching for unfamiliar topics. However, he used long search query in searching for his topic of interest.

Tasweek Wsayel altwasel alejtemayee Marketing of the social media tools, got no results. Well I'll search for Tasweek alwasael alejtemaeeyeh (Marketing social media)! no results as well. I guess I need to change the search word again, so I'll type in وسائل التواصل الاجتماعي Wsalyel altwasel alejtemayee( social media tools), now got results.

### 1.2.1 Guessing technique

Guessing is a term used by the subjects themselves, it appeared only when they started to search the Arabic tasks. It was noticed that this term used with the subjects who received their education in English language. Subjects followed the guessing technique in order to identify the suitable keywords to be used in the search query.

Well, here I'm not sure about the suitable keyword, I think I'll use the الوصول الى المعلومات *alwosool ela almaalomat* (Access to information), I'm just guessing and don't feel completely sure that I used the right words. So I'll search for الوصول الى المعلومات الحكومية *alwoosol ela almaalomat alhokomeyeh* (access to governmental information) [SPEUFA45]

I feel like I'm guessing the search words here and manipulating on the database to get some results! Never mind I'll go to basic search and type in الوصول للمعلومات *alwosol lel maaloom* (Access for information). [SPEUFA40]



Nevertheless, guessing was not used as a search technique with the subjects who received their education in Arabic language; this is because they are more exposed to the terms in Arabic language. The guessing technique also appeared in the filtering tactic with judging the relevancy of the results as well.

**1.2.2 Manipulating**

Manipulating is a word revealed by the subjects in describing the difficulty they face while trying to identify the keywords for the search query. Manipulating appeared only in seeking the information in Arabic language. The E-marefa database offers a keyword suggesting tool, however subjects who used these suggested keywords with the first task in sample one and the first and the second tasks in sample two were faced with no results. *The manipulating as a word was used as the subjects showed their frustration of keep changing the search words as the database suggests, but they got no results back..*

*...I got no results however I used the suggested keywords. Well, I'll change the search query, I'll type the word عدالة adalyeh (Justice) again and I'll see what the suggestions are. Here we go, I have many suggestions I'll select the first one العدالة المنظمة aladaleh almonazameyeh (organization justice). Then click search! Also got no results! I'm like manipulating with the database in order to find a result. [SPAUF31]*

**1.2.3 Problem of synonymous**

The synonymous is one of the ambiguities in Arabic language. The problem of choosing the right words or the concepts to use for each task appeared here, most sources of the modern social sciences majors are translated from English language. Therefore, different translations appeared for the same concepts. This imposed burden on the subjects when started searching the Arabic tasks. Opposite to English language, the problem of the synonymous appeared frequently in searching in the Arabic database.

It is worth mentioning that considering the synonymous as a problem with those subjects was not for the lack of knowledge about the topics of the tasks, but only the lack of knowledge of the best word to use to express their queries. This problem appeared with those subjects even

in the familiar topics. Language of education had an impact choosing the search word from the synonymous. Subjects with Arabic education considered it as an advantage in the Arabic language.

*I'll type in the basic search box الحوكمة نظم المعلومات alhawkameh nozom almallomat (Governance information systems), I got no results! It could be because of the synonymous of the word الحوكمة alhnawkameh (Governance) in the Arabic language, this is because they translate the words from English language differently so you would find different words with the same meaning and this makes it more difficult on the searcher. [SPEFA47]*

### 1.3 Identifying the source

Levels of knowledge subjects already have about the topics affected their choices of the suitable sub-database. Effect of the background knowledge on the tasks was clear with Subject 43.

*I'll choose social sciences and click continue. I need to think of the keywords here, I guess I'll write الوصول الى المعلومات Alwosol lel maloomat (access to information), no results were found, I guess this topic is in the business management and accounting database, so I'll go back and choose to search it in the business management and accounting database. [SPEUFA43]*

### 1.4 Information need formulation

The second activity in the lead in strategy was the information need formulation. Subjects during the experiment formulated different information needs. The information needs were captured by the way subjects formulated their queries. Different factors had influence on those needs; prior and the tacit knowledge, search experience, language of the education received, publishing language and the query domain. Table 3 summarizes the different needs, the external and internal factors, feelings and thoughts

**Insert table 3 here**

## 2. The core strategy

Core strategy consists of different tactics; these are, *exploring* by starting with general search on the topic and *browsing* in an open way to become more oriented to locate more general

information about topics. *Abandoning* tactic appeared to mark a difference between subjects' behaviour in searching the two languages, where subjects deliberately abandoned using the advanced search and the Boolean operators in the Arabic language. Nevertheless, *manoeuvring* is a joint process appeared in searching the two languages; however it appeared in less intense in the Arabic language. *Manoeuvring is mainly about modifying the search query and changing search query to narrow down and widen up results.* *Linking* also appeared during the core strategy where *subjects followed different chains like references or searching for specific authors.* *Refining* was a tactic happened during the whole stage by applying subjects own relevance criteria to restrict the search and to judge relevancy of results.

The following are extracts on each tactic in the core stage:

**1.2 Exploring:**

The subject group of English education developed stable well defined needs as mentioned in table 2; this affected their way of exploring the topics of the tasks, they started exploring tasks by formulating general queries with the use of long search phrases in the basic search.

*"I'll select all the databases to search in first. I'll search the first topic I'll type in الوصول الى المعلومات الحكومية alwosol ila almaaloomat alhokomeyeh (access to governmental information), no results were found! I think I need to make the search query a bit shorter, so I'll search about المعلومات الحكومية almaaloomat alhokomeyeh (government information)" [SPEUFA36]*

On the other hand, the data analysis revealed that subjects who received their education in Arabic language were more experienced in searching in Arabic language as they mainly publish their works in Arabic language and most of the times they use Google search as their main source for the online published Arabic articles. Information needs of this subjects group were variable well defined which affected the way subject explored topics of the task differently from the other group. The queries subjects used were short and well expressed.

Thoughts and feelings associated with this search tactic were open and opening with high curiosity, however their needs were well defined but the uncertainty remains high due to the unfamiliarity with the query domain and the low expectations from the Arabic databases.

“Ok, I’ll use keywords only here in order to retrieve results, because in Arabic databases the content is usually limited, I’m telling you from my experience. So I’ll type in decision making and click search” [SPAUFA24]

Surprisingly, in searching familiar topics, subjects who received their education in Arabic language had less experience in searching their topics of interest by using databases. Information needs identified by this subject group played a role in the way they explored the familiar topics in Arabic. Information needs of the subjects were stable and well defined; they showed low curiosity for searching their topics in Arabic language, those subjects were less experienced in searching databases in general, therefore, this internal factor affected their way in expressing queries. The queries used by the subjects were long queries in a form of long phrases, though they were using controlled language. As some of them mentioned that they do not use Arabic databases and they count on library shelves to retrieve whatever information they need.

*To be honest I don’t use Arabic databases, however, if I needed to include what we called the foreign literature in any research I write, I go to databases such as science direct, apart from that I either go to the library or use Google scholar to search for the needed articles* SPAPTQ21]

### 1.2.1 Abandoning

Abandoning is the behaviour subjects followed in searching the Arabic tasks by abandon using advanced search and Boolean operators. By linking the results from the analysis of the experiment and post task interviews; subjects abandoned using advanced search because they anticipate retrieving no results if they used advanced search with the use of Boolean operator.

*I usually follow the same behaviour with Arabic databases, I do only general search because I knew there will be always limited content.* [SPAUFA22]

The same behaviour appeared in searching their topics of interest; subjects kept using the basic search and abandoned using the advanced search even when they faced with no results.

*تسويق وسائل التواصل الاجتماعي Tasweek Wsayel altwasel alejtemayee (Marketing of the social media tools), got no results. Well I’ll search for تسويق الوسائل الاجتماعية Tasweek alwasael alejtemaeeyeh (Marketing social media)! no results as well. I guess I need to change the*

search word again, so I'll type in وسائل التواصل الاجتماعي *Wsalyel altwasel alejtemayee*( social media tools), now got results. [SPAFA31]

1.3 Maneuvering

The following extracts show how subjects modified the search query many times in searching for their topics of interest using only the basic search and showing their doubts in finding the results they look for.

*I'll type in سلسلة التوريد استراتيجية istrategyet selselit altwareed (strategy of supply chain) then I'll click search...I got results, but all are irrelevant, this is maybe because there is no published literature on the topic in Arabic language. However I'll change it to سلسلة التوريد selslet altawreed (supply chain) Also no results! .I'll try to find سلسلة التوريد selsetlet altazweed (acquisition chain)! I got nothing as well! Usually I take no advantage when searching for Arabic articles. Always there is nothing... of course this is due to different reasons; there are no Arabic databases, the level of the search in the Arab world is not equivalent to the level in the English world. The third thing, there are always spelling errors in the Arabic articles. And Arabic journals themselves prefer the references to be in English language not in Arabic language. [SPEFA7]*

1.4 Linking

Only few subjects followed the linking behaviour in searching Arabic tasks opposite to English task. Some of them referred that to the lack of content in the Arabic databases where their priority is to retrieve results in the first place.

*“if I'm searching in English language it would be more easier as I know the eminent authors in the field so I would search the topic by searching on a specific author name and read what he or she wrote on the topic, in Arabic it is a bit different, because my own concern is to retrieve result at the first place.” [SPEFA49]*

1.5 Refining

*Refining is characterized by applying subjects' own relevance criteria during the search process. Refining was categorized under two categories; refining in exploration process, this is by using advanced search options to restrict the search, such as restricting the search in title field or a fixed period of time. The second category was refining after retrieving results,*

which happens more obvious after subjects finish the manoeuvring activity, but it was observed during the whole process as well.

The following is an extract for Refining in the exploration process

*I'll go to basic search and type in الوصول للمعلومات alwosol lel maaloom, (access to information). I got 6 results. The results look relevant, the first one is talking about the information accessibility, this one is talking about library information systems which looks relevant. However after reading the titles of the articles and having a look at them the relevancy is not high. So in this case I need to be more careful with the query that I use. I'll try to use the synonymous of the word الوصول alwosol (access) and see if I'll get relevant results in this case. I'm typing now إتاحة المعلومات الرسمية etahit almaalomat alrasmeyeh (access to formal information) and I'll choose to search it in the title field,[ SPEUFA40]*

### 3. Closure

In the closure strategy subjects reached their final destination, feelings of confidence in conducting the search have arose. Subjects' thoughts are clearer and focused at this stage. Selectivity in choosing articles appears very low in English and high in Arabic language, sifting the results is the main activity at this stage, the focus is on the relevance judgment process. The end point of this stage was subjects either terminate the search process satisfied with the findings, or unsatisfied, going back to the middle stage to modify the search query or change it in order to retrieve relevant results.

The primary tactics of closure are:

#### 3.1 Integration

*It means in this context that subjects integrate and combine two results together; this was by bringing together two relevant articles in order to best answer the information query.*

Integration was observed only with subjects with English language education who have high search experience in using databases and who showed openness during the search process.

“Here I need to read about organizational justices separately and then on employee loyalty, then of course I need to read about them together as well” [SPEUFA3]

“From reading the titles and the keywords there is relevant results but still I need to search for the second part to get highly relevant articles, that make me more satisfied” [SPEUFA14]

**3.2 Filtering**

In the closure strategy subjects start to filter the results they got in order to find results match with their relevance criteria. Subjects have Feelings of satisfaction on the search process they conducted. Subjects apply their relevance judgment criteria in order to filter the results they got.

**3.2.1 Relevance judgment:**

Few differences in the relevance judgment criteria appeared when the subjects started the sifting tactic for the familiar and unfamiliar topics, and some differences appeared between the two languages.

Subjects in judging relevancy of the Arabic articles, especially the familiar topics, become more selective in the way they look at the whole retrieved information and strict with their own relevance judgment criteria. This is because of as most of them mentioned the way articles indexed in Arabic databases; as the database would retrieve any articles contain the key words they used no matter of the context that keywords used in, and because of the lack of the content in Arabic databases. However, the story with English databases is different as there is plenty of online published literature and the possibility to retrieve relevant results is high.

“ I’ll type in إدارة المعرفة Edaret almaarefa (knowledge management), I got 138 results most results are irrelevant, it took the word management and gave everything about management. If I want to judge relevancy of Arabic articles I use the same criteria for English but I’ll focus more on the journal and the region of publication, for example I would exclude all the results from countries like Sudan or Yemen,I know it is a prejudice but I do it most of the times, and on the other hand, I would trust any journal from countries like Jordan, gulf countries and so on” [SPEFA36]

As well as, complexity and simplicity appeared to be criteria for the subjects when judging the relevant articles:



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*“The ability to understand is also a criterion that I use, sometimes in English articles there is easy to read and understand language (simple), sometimes people use the difficult synonyms for the word this makes the article difficult to be read, in one line you find many words that you don’t understand so you stop reading and go to another article...*

*... Also another important thing is the complexity of the title, if the title is complex this makes me happier to read the full text. ” [SPEPTQ7]*

### 3.3 Selection

Selection appeared in the information seeking behaviour in searching in both languages. However, it appeared in more intense in searching in Arabic language. According to subjects the results are always limited in Arabic language which makes them to choose from the limited results that they have, even if the result is not completely relevant.

### Discussion

Subjects showed different seeking strategies, search tactics, thoughts and feelings during the experiments and interviews. The analysis revealed that the subjects are splitted into two groups; subjects who received their education in Arabic and subjects who received their education in English. Subjects who received their education in English language had better knowledge in English and appeared to have better search experience than the subjects who received their education in Arabic language. Generally subjects with Arabic education showed less critical thinking and less interest in widening up their searches and mostly they used the keywords as given to them in the task sheet. Opposite to other subjects who tried to widen up their search by keep modifying search words, using synonymous of words and using Boolean operators to link between search words. The issue of the critical thinking with Arabic scholars was mentioned in different studies in the education field and information literacy. Similarly, the publishing language appeared to be a factor affecting the seeking process. Subjects who received their education in Arabic language tended to publish more in Arabic language than the English language.

Fahmy and Rifaat came across the factors undermine the critical thinking of the scholars and they return the reasons to the education in the Arab countries where students are receivers of the information, they state that *“Arabic students rarely question authorities, such as teachers, and sometimes the simple act of asking a question to seek clarification or explanation is discouraged and frowned upon, and hence the whole concept of critical*



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*thinking, analysis, developing one’s own opinions, and ultimately creating the knowledge cycle, all of which are characteristics of an information literate person, is at best frustrated and at worst denied.” (Fahmy and Rifaat,2010. p114).*

search experience and domain knowledge played a role in the information seeking process in both languages in general. That was obvious in the maneuvering tactic, where subjects who got search experience and domain knowledge maneuvered more with the queries and the search process. Shute and Smith (1993) found that domain experts use more terms than novices when searching in databases, illustrating that domain experts have larger vocabulary with which they are able to generate queries.

The researcher proposed the following model for cross-language information seeking in Arabic and English language.

**Insert figure 2 here**

**Conclusion**

**Information seeking behaviour in the two languages shared the three search strategies. However, the search tactics varied between the two languages. The differences appeared in the search tactics between the two languages are illustrated in the table 3**

and 4. More search strategies and tactics appeared in seeking tasks in Arabic, subjects explained this as online Arabic published literature is less than the English one and this puts burdens on them in using different search strategies in order to retrieve results from the database.

The information seeking behavior of the subjects was modeled based on the different search strategies subjects followed in searching tasks in both languages depending and the feelings and thoughts associated these strategies during the search.

Insert Table 4 here

Insert table 5 here

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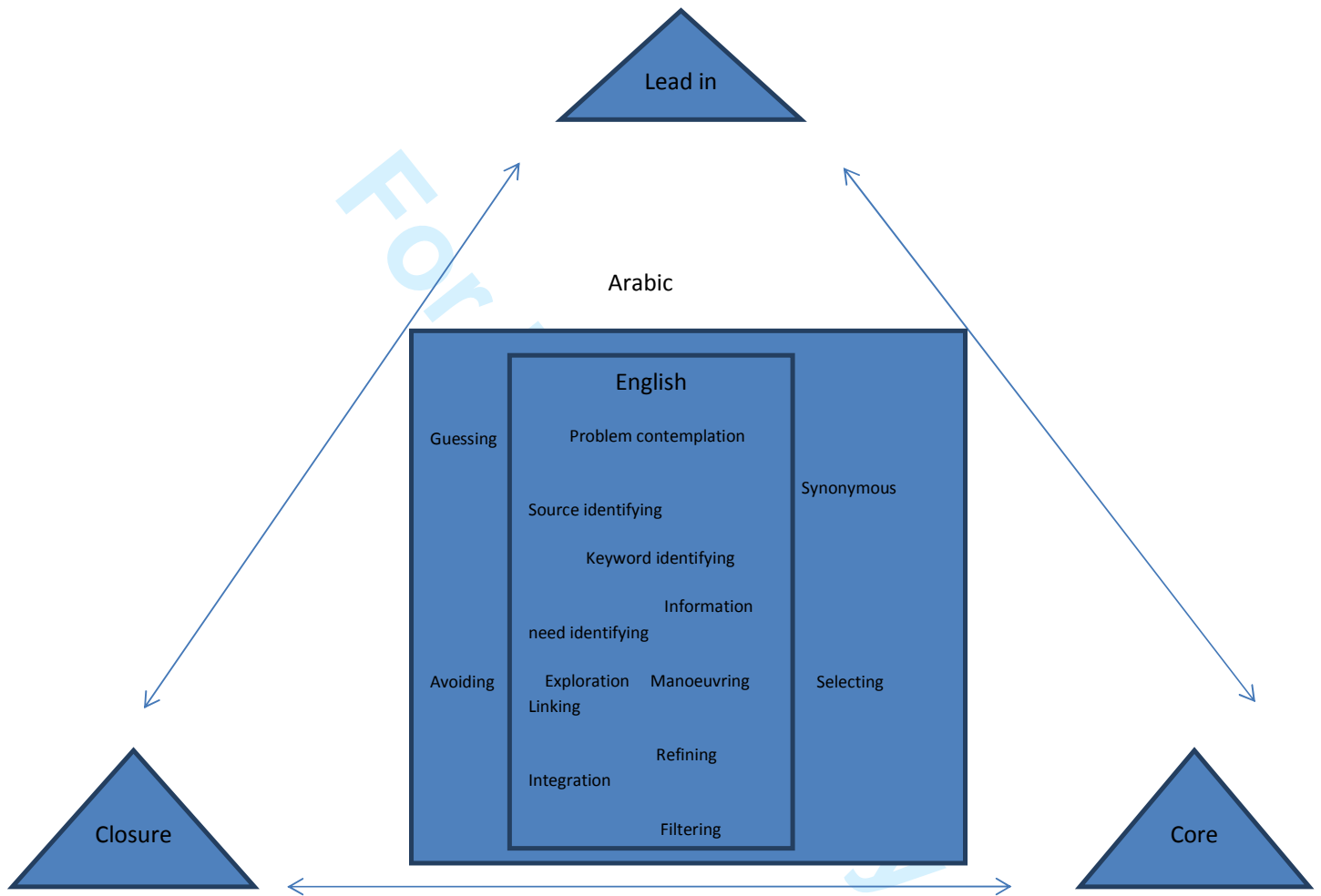


Figure 2 Cross-language information seeking behaviour model



Subject	Topic	System	Language	Searches	Total searches
1	1	1/2	Arabic/English	2	2
	2	1/2	Arabic/English	2	4
	3	1/2	Arabic/English	2	6
Total 57 subjects					6*57 N=342

Table 1: Overall design of the experiment

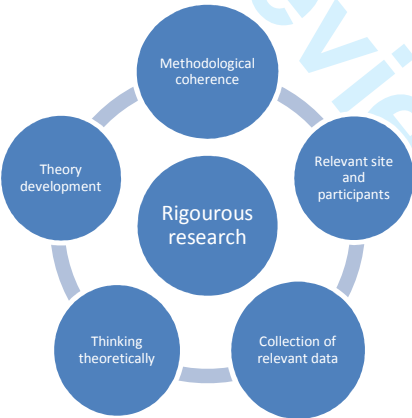


Figure 1 Criteria used to maintain research rigour

Research question	Questions of the post task interviews
<ul style="list-style-type: none"> <li>Do information seekers generate different compromised information needs depending upon the language used?</li> </ul>	<p>PTQ 5: In expressing query, was there a difference between the two languages?</p> <p>PTQ 6: Did you feel there were any changes between the two languages in regards problem formulation?</p> <p>PTQ1: Did you feel there were any differences between the systems that you used to search for the same query?</p>
<ul style="list-style-type: none"> <li>If there are, how do compromised information needs relate to aspects of behaviour such as problem formulation, search querying, information seeking and relevance judgments?</li> </ul>	<p>PTQ 2: How did you feel when you searched the different systems using different languages?</p> <p>PTQ 7: Did you feel there were any changes between the two languages in regards search querying (the way you search a query)?</p> <p>PTQ 8: In regards the relevance judgments or judging which information that met your needs, did you feel there were any differences in the two languages in judging the relevance of the retrieved information in meeting your needs?</p> <p>PTQ 9: Did you feel there were any changes between the two languages in regards the information seeking way in searching (the way you seek information from formulation of a need to meeting such a need)?</p> <p>PTQ 4: Which language do you feel more comfortable to search in?</p>

Table 2: Methodological coherence between research questions and post task interview questions

External factors	Internal factors	Feelings and thoughts	Familiar topics in English language	Familiar topics in Arabic language	Feelings and thoughts	Internal factors	External factors
Time constraints.	Knowledge of English. Education received in English. Experience in using databases	Open. High curiosity. Limited uncertainty. High self confidence	-Variable well defined needs	Stable well defined	Reductionism. Low curiosity. High certainty	Education received in Arabic language	Time constraints.
Access and obtain of articles.	Poor knowledge of English language. Education received in Arabic	Open with sense of reductionism. Low curiosity. Limited uncertainty. High self confidence	-Stable well defined	Variable ill defined	Open. High uncertainty. low curiosity, frustration and anticipating no results	Education received in English language. High knowledge of English language	Access and obtain of articles.
Ease of using Database							Ease of using Database
External factors	Internal factors	Feelings and thoughts	Unfamiliar topics in English language	Unfamiliar topics in Arabic language	Feelings and thoughts	Internal factors	External factors
Time constraints.	Education received in English. High Knowledge of English language	Open. High curiosity. High uncertainty	Variable well defined	Variable ill defined needs → stable well defined	Open. High uncertainty. High Curiosity frustration. anticipating no results	Education received in English language. Query domain	Time constraints.
Access and obtain of articles.							Access and obtain of articles.
Ease of using Database	Education received in English. High knowledge of English language	High self confidence. High certainty. Low curiosity	Stable well defined needs	Variable well defined needs	Open. Uncertainty. High curiosity	Education received in Arabic	Ease of using Database
	Query domain Education in Arabic, low knowledge in English	Reductionism. Low curiosity	Stable ill defined needs				

Table 3: different information needs appeared during the experiments

Figure 2 Cross-language seeking behaviour model

Lead in	Core	Closure
Problem contemplation	Exploration	Integration
Identifying keywords		
■ Guessing		
■ Manipulating		
■ Synonymous		
Information need	Avoiding	Filtering
formulation	Maneuvering	
Identifying source	Linking	Selecting
	Refining	

Table 4 Strategies and tactics appeared in searching the Arabic tasks

Lead in	Core	Closure
Problem contemplation	Exploration	Integration
Source identifying	Manoeuvring	Filtering
Keyword identifying	linking	
Information need identifying	Refining	

Table 5 Strategies and tactics appeared in searching English tasks

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